

What is Claimed Is:

1. A system for processing magnetically stored data, comprising:  
a magnetic medium having digital data residing thereon; and  
means for performing a low-density parity check operation on the digital data  
residing on the magnetic medium.
2. The system of claim 1, wherein the means for performing a low-density parity  
check operation uses a low-density parity check code and a respective low-density parity  
check matrix having n-rows and m-columns where m and n are positive integer numbers, and  
wherein any two columns of the low-density parity check matrix have a maximum of one  
common location containing a non-zero entry.
3. The system of claim 2, wherein the low-density parity check code has a rate of  
16/17, and the low-density parity check matrix has a constant column weight of three and a  
constant row weight of fifty-one.
4. The system of claim 1, wherein the means for performing a low-density parity  
check operation processes data using a low-density parity check matrix, wherein the low-  
density parity check matrix has a size of 272 rows by 4624 columns.
5. The system of claim 4, wherein the low-density parity check matrix is formed  
using 17 sub-matrices, each sub-matrix having 272 rows and 272 columns, and each one can  
be computed from one another. Each row in a sub-matrix can also be computed by cyclic-  
shifting the previous row.
6. The system of claim 4, wherein each sub-matrix of the low-density parity  
check matrix is divided into 17 sub-portions, each sub-portion having 16 consecutive

columns, and wherein each sub-portion is constructed such that any 2 columns within the sub-portion have no common location containing a non-zero entry.

7. The system of claim 4, wherein the means for performing a low-density parity check operation includes a checks-to-bits device that determines the minimum-entry for a particular row of the low-density parity check matrix, and further determines the second-minimum-entry in the same particular row.

8. The system of claim 7, wherein the checks-to-bits device further determines a sign value.

9. The system of claim 8, wherein the checks-to-bits device assigns one of a  $\pm \text{min1}$  or a  $\pm \text{min2}$  value to a row of the low-density parity check matrix.

10. The system of claim I, wherein the data on the magnetic medium is formed using a number of data blocks, each data block including a data field, a sync field and a tone field.

11. The system of claim 1, wherein the data on the magnetic medium is formed using a number of data blocks, each data block including a tone field; and  
wherein the system further includes a tone detector that detects a frequency in at least one tone field, then provides framing information for a partial response signaling device.

12. The system of claim 1, wherein the data on the magnetic medium is formed using a number of data blocks, each data block including a sync field; and  
wherein the system further includes a sync detector that detects a sequence in at least one sync field, then provides alignment information for aligning data to the low-density parity check means.

13. An apparatus for performing a low-density parity check operation on a block

of received data, comprising:

a checks-to-bits device that determines the minimum-entry for a particular row of a low-density parity check matrix, and further determines the second-minimum-entry in the same particular row.

14. The apparatus of claim 13, wherein the checks-to-bits device further determines a sign value.

15. The apparatus of claim 13, wherein the low-density parity check matrix is cyclic.

16. The apparatus of claim 13, wherein the apparatus uses a low-density parity check matrix having a size of two-hundred seventy-two rows by four-thousand six-hundred and twenty-four columns, and wherein the low-density parity check matrix is divided into seventeen sub-matrices of two-hundred seventy-two rows by two-hundred seventy-two columns.

17. The apparatus of claim 16, wherein each sub-matrix of the low-density parity check matrix is divided into seventeen sub-portions, each sub-portion having sixteen consecutive columns, and wherein each sub-portion is constructed such that any two columns within the sub-portion have no common location containing a non-zero entry.

18. The apparatus of claim 13, wherein the apparatus uses a low-density parity check code having a rate of 16/17, and the low-density parity check matrix has a constant column weight of three and a constant row weight of fifty-one.

19. A system for processing magnetically stored data, comprising:  
a magnetic medium having digital data residing thereon, the digital data being formed using a number of data blocks, each data block including at least a data field and a tone field;  
and

a decoder that includes a tone detector that detects a frequency in at least one tone field, then provides framing information to a partial response signaling device.

20. The system of claim 19, wherein each data block further includes a sync field; and wherein the decoder further includes a sync detector that detects a sequence in at least one sync field, then provides alignment information for aligning data to a low-density parity check device.